

ART. II.—*A very early Human Ovum, presenting the ununited folds of the blastodermis about to form the amnios.* By MYDDELTON MICHEL, M. D., Lecturer on Anatomy and Physiology, Charleston, South Carolina, [with a plate.]

IN endeavouring to establish the laws which regulate the phenomena of development—that deeply interesting topic of philosophical anatomy—all the forms of organic life have been arrayed in a vast field of observation and research.

Speculative inquiries, yielding to the rigour of experimental investigation, have found a just interpretation in the interesting facts which now enrich this department of physiology, and which, interwoven as they must soon be in one fundamental plan of organization, will constitute a new era in the science of which they form a part.

In this newly, and only partly explored province, though our knowledge has progressed with almost electrical rapidity, thanks to the labours of a Baer, Coste, Serres, and Barry, yet no small and fertile source of discovery and instruction still remains as an allotment for the assiduous inquirer. Attention was first directed, as was very natural, to the development of organisms the more readily obtained and promising the surest results, rather than to such as should more properly have ranked as the type of comparison, as the guide in the chain of complex phenomena; it does not therefore surprise us, that the first discoveries in these extraordinary organic operations were the result of experiments instituted on the domestic fowl by Baer. Subsequently, these important facts were more correctly interpreted by experiments made in the higher series of mammals by Prof. Coste, while they in their turn received that confirmation which a modification and simplicity of development, observable even among the invertebrates, seemed afterwards to justify. However, our imperfect knowledge of these organic processes in some classes of beings, still constitutes a veritable interruption in the series of observations which this plan proposes. There are many of these classes again of which very little is known and less devised, that would certainly reveal important truths—we may instance the marsupials—while all our knowledge of other developments, where the usual means of research are impracticable, are inferences drawn from analogy, being a dialectical process the more irreproachable, the more extensive our acquaintance with the rest of the series, though not itself possessed of all the share of proof which the gravity of anything like fallacy would demand. To this category belong whatever observations have hitherto been made concerning the earlier periods of human development, from the impracticability attending any empirical examination of the question. The similarity of some of the transitory stages of animal development, to the subsequent developing acts of the human embryo, as also the appa-

Fig1.

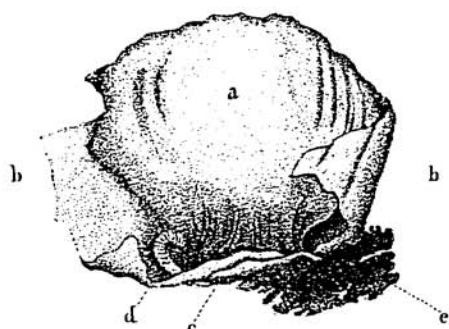


Fig 2.



Fig1.a. Umbilical vesicle, its wide opening into the embryo is clearly seen.

bb. Outer layer of blastodermis cut through and reversed to bring the umbilical vesicle into view.

c. Back of embryo destitute of any covering. The cephalic extremity d is raised upwards beneath a fold of the blastodermis which is seen surrounding it as a nebulous outline.

e. Pillous piece of organizable lymph that was inseparably connected with the crum.

Fig2. Size of crum after soaking in alcohol.

rent identity of their primeval germs—the initials of creation—fully authorize the conclusion, that the intervening stages in the human species catenate with those of other animals, without implying, on that account, that man is the integral expression of any one of the series, an opinion as erroneous as unscientific, divesting the truths of their ennobling bearings, and justly to be repudiated as possessing the most dangerous tendency.

While I exonerate myself from all share in divulging opinions hostile to existing sanctions, under the form, whatever it be, which they may assume in this or any of my future contributions to the subject of organic evolution, yet I so far protest against the habit of interpreting facts to support particular views, instead of relying on the correctness of these, as the means of their defending themselves, that I will give a further exemplification of this law of progressive formation by the history of what I consider to be the earliest human ovum on record, next to that described by Allen Thomson.

This curious specimen of which I am in possession, is extremely valuable, as its condition is perfectly normal—a circumstance so rare in cases of abortion, that most specimens of early human ova have been lost to science, by falling into the hands of those who, not being familiar with the subject, have by their descriptions given rise to the greatest variance of sentiment. It is of still greater value as verifying the accuracy of that singular parallelism in development, of which it is a glorious exemplification, it being impossible as yet to distinguish to which order the being appertains; while its early age is a further proof of the identity in the process which evolves the membranes, as well as of the synchronical order in which they appear. These circumstances justify my regarding an account of this specimen as a contribution towards supplying the gap existing, among the observations made on the human ovum.

It was in the month of June last (1846) that I was consulted by a gentleman of this city, in behalf of his wife, as he was desirous of ascertaining the nature of a slight sanguineous discharge, attended with much pain, which had greatly inconvenienced her, then nursing a child at the breast. A clot of blood of singular appearance that had been eliminated, was more particularly the object of his visit, knowing, as he stated, that my attention was directed to the subject of ovology, and believing the accident in question to have occurred in consequence of conception.

The small quantity of blood passed, being scarcely in relation with the extreme inconvenience that ensued, was an objection to its being a return of the menstrual act, as this was unattended habitually with any uneasiness; but the very delay in the re-appearance of the catamenia, and the child at the breast seemed also to militate against the probability of conception, and consequently of abortion having taken place, though I inclined to this last opinion. A simple inspection of the regular shaped clot seemed to favour a belief which a more careful examination was about to corrobo-

rate. The gentleman's testimony positively implied that if it were anything of the kind, it must surely be very young, and the details which were given were of a nature not to be questioned.

Therefore, with an anxiousness which so unexpected an occurrence was calculated to excite, the substance was submitted to ablutions with alcohol and water, and by removing the clotted blood, soon exposed a small fleshy body to view. As my curiosity was aroused by the discovery of this little body, I proceeded to make an inventory of its contents, with all that precaution which should be the invariable prerogative of so small, so delicate an object. Resorting to another vessel containing diluted alcohol, the better to examine this substance, a small incision was made in a smooth, semi-transparent and spherical portion projecting beyond the rest, which I then recognized to be the reflected portion of the decidua, inasmuch as a partly transparent vesicle resembling an early ovum lodged within this receptacle, passed out very readily, floating in the surrounding liquid. So exceedingly delicate was this second object of attention, that I deemed it advisable to leave it awhile, to become strengthened in its structures by the action of the alcohol before I should proceed. When a further examination was instituted, I was enabled to determine what follows, and had the pleasure of exhibiting the same to Professor Prioleau of this city.

A very short contact with the alcohol brought the condition of this little ovum very plainly to view, and at once pointed out the fairest resemblance to the ovum in the uterus of a rabbit. Indeed, a blastodermic formation had already taken place, of which I was not apprized, until by the imbibition of alcohol its double layers were separated. The vitelline membrane had disappeared, the chorion which must have somewhat advanced had been left behind, for around the ovum hung an araneous structure, which appeared to be the incipient bonds of its connection with the chorial covering from which, in all probability, it had been removed.*

Though this flocculent film existed more particularly upon one side, I am not prepared to say, whether this really corresponded to a part of the chorion, nor had it any more the appearance of chorial villosities than have (in my opinion) similar projections of the vitelline membrane in the rabbit. Through the transparency of the ovum could be distinguished the inner layer of the blastoderm, as an encased sphere, forming the umbilical vesicle. In turning over the ovum, there appeared to be on one side a thickening of its structure, as if a bit of organizable lymph was connected with it just at this spot, but on cutting through and reversing the outer layer, this appearance proved to correspond with the first and earliest condition of the embryo. The umbilical vesicle towards the embryo was but slightly constricted; this was its principal feature, no vascularity being per-

* I regret that having thrown away the decidua with the clotted blood in which it laid, I deprived myself of the only means of determining the above question.

ceptible. The embryo had advanced in development further than the *nota primitiva* or *tache embryonnaire*, as it exhibited a cephalic and caudal extremity. The umbilical vesicle entered widely on the anterior surface of the embryo, but I could discover nothing which indicated the presence of an alimentary canal, consequently no allantois was as yet formed; on the lateral surfaces not the most remote sign of thoracic or abdominal tubercles were discoverable. The ovum was evidently at that period of development, in which the outer layer of the germinal membrane begins to fold itself over the back of the embryo to constitute the amnion. It was to verify in the human ovum the commencement of this interesting process that I felt most desirous, though at first from the difficulty attending its detection, I supposed it not to have commenced, but on tilting the embryo upwards with the point of a needle to bring the light to bear upon the cephalic extremity, I could then observe a nebulous outline following its convexity for a little distance backwards, which was plainly the fold in question. It had advanced so little over the embryo, that much of its back laid bare against the coagulum of lymph already mentioned, but I could here readily pass the head of a very small pin beneath the cephalic hood. The caudal hood adhered to the coagulum, and consequently was not interfered with, lest the specimen might be injured before I delineated it. The back of the embryo presented a slight groove, though the vertebral canal was certainly not open. (*Vide Plate.*)

Here is the most beautiful example of human development ever seen; unexceptionably similar to other species of ova at the same period of their changes. Its disconnection with the chorion, which must have been in an incipient stage of formation, implied the absence of the allantois, a structure as essential to the nature of the chorion as it is indispensably requisite in conveying blood-vessels to it; no amnion existing inferred the early transformations of the germinal membrane and the extensive umbilical opening whose obliteration coincides with the perfection and completion of the amnion: while, again, the entire progress of the embryo accorded with the succession in which the membranes were being formed. Mindful, indeed, of the rapidity of development after the egg reaches the uterus, we cannot suppose the present ovum to have sojourned more than 60 to 80 hours in that cavity, as it had advanced but little further than the unfolding of the blastoderma.

If now we review the several descriptions relating to the earliest periods of embryonic formation, they all, with one exception, will prove further advanced than that which we have just had under notice.

Sir Edward Home and Bauer* in 1817, attempted the description of a very young human ovum, in a paper obnoxious to the charge of such unbounded ignorance of the subject canvassed in it, and such painful blind-

* Philos. Trans., p. ii. p. 252, 1817.

ness to the truth, that we are surprised at the currency it has for a long time received, and only allude to the publication as valuable in a historical point of view. This was clearly no ovum, and if it had been, the very means employed in the examination would have radically destroyed it.

On the authority of Dr. Allen Thomson, I am disposed to regard the fifty ova described by Dr. Pockels* (only four of which were between eight and sixteen days) as all of a later date than that specified, as the drawings show the evolution of structures which cannot accord with the assumed age.

The specimen recorded by Edward Weber in 1830, would certainly be of a most recent date if there were not that variance of account which invalidated all testimony. In one publication it is stated that an ovum of the earliest development was present; while another account places its existence in the equivocal light of a possibility, on the plea of an ovarian vesicle appearing as if it had just discharged its ovum. It is but justice to Weber to state that I am indebted to the excellent paper of Allen Thomson† for an account of this ovum, and it should be stated that neither Allen Thomson nor myself has seen Weber's original communication. Nevertheless Bischoff who probably has carefully read it, assigns very little value to it.

In 1833 Velpeau‡ described three human ova. Two of these were diseased, and I am inclined to believe were of a certain development, for he first speaks of their being composed of a simple vesicle, and that this possessed a villous appearance, though there were no traces of an embryo. This involves some considerable obscurity if not an impossibility, unless we accept these as examples of morbid condition.

The other ovum is the well known and valuable specimen furnished him by a midwife of Paris during the publication of his work on "*Ovologie Humaine*."

But this remarkable ovum was known to be positively thirteen days old. There was an amnion enveloping the embryo; an umbilical vesicle completely formed, and a chorion covered with flocculi. The development of the embryo, though by no means clearly or accurately described, must have coincided with this advanced condition of its membranes.

Professor Muller, in his Archives for 1833, mentions an ovum much farther developed than such as we are considering. With regard to its age I am disposed with Baer and Wagner§ to compute it at twenty-five days, though Muller himself places it at thirty-four days. The embryo was rapidly advancing, branchial clefts and arches were recognizable, and a complete evolution of its membranes had already occurred.

* Heft. xii. Oken's Isis, 1825.

† Edin. Med. and Surg. Journal, 1839, vol. 52, p. 119.

‡ *Ovologie Humaine*, p. 77, 1833.

§ Histoire de la generation, R. Wagner (traduit par Habets) p. 147.

With reference to Mr. Wharton Jones'* history of an ovum, which Dr. Thomson regards "as one of the earliest, if not the earliest human ovum, that has been accurately described," there appear to exist difficulties scarcely reconcilable with our present information of ovology. Details of an ovum are given belonging only to such as have just reached the uterus. Now those who have experienced the difficulties attending the examination of the ova of rabbits in a similar situation, who know their extreme delicacy, when it has been our good luck to surprise them in the primitive transformations of the germinal membrane, must hesitate to regard with confidence an occurrence open to so many sources of error as the one related by Mr. Wharton Jones. It is stated that Dr. Mackenzie first fell in with this early example of human development. It was lodged within a perfectly formed decidual membrane which came away from a patient of his. After removing the ovum which was "*the size of a marrow-fat pea,*" he describes it as presenting a "*shaggy villous surface on one side,*" which clearly shows it to have been the chorion. Indeed it was accepted as such both by Drs. Mackenzie and Jones. The former punctured it and perhaps passed the instrument, as he says, "*through the amnion by which some fluid escaped,*" adding "*that nothing more was attempted.*" To say the least of such a manœuvre, it was treating the ovum with very little respect, and that "*nothing more was attempted,*" seems a kind consideration for its condition, if we suppose a moment that it belonged to the early date alleged by Mr. Jones. But this treatment was nothing to that which it ultimately underwent. Dr. Mackenzie sent it to Cork, where Mr. Jones received it in good order after its journey of perhaps three hundred and fifty miles. It is equally positive that delicate as the specimen might have been, it was laid aside for five months, for from Mr. Jones' own account, he examined it "*in the spring of 1836;*" now Mr. Mackenzie's letter containing a description of it is dated November 29th, 1835. Again, Mr. Jones must himself have entertained doubts as to the true age of this egg, as we may infer from a subsequent letter from Dr. M., referring to this very point in which he writes: "*The ovum in question I consider as three or four weeks old. The lady had missed one menstrual period, and thought herself four weeks gone.*"

In presence of these considerations it is difficult to share in an opinion which regards this ovum as having been at its earliest evolution, or to admit with Mr. Jones that "*the embryo had not yet appeared, though the vesicular blastodermis was undergoing the preparatory changes.*" An ovum at this period of development would have required the utmost precaution and delicacy to secure it for microscopical investigation, demanding immediate examination, when it would have revealed unequivocal signs of its age. It would have presented a vitellary membrane invested with a re-

* Philos. Trans., p. ii. p. 339, 1837. Observ. 5.

duced layer of the albumen acquired in its transit through the tube, and the vesicular blastodermis would have filled and lined the inner surface of the vitellary membrane, it could not have possessed a chorion *shaggy and villous* on any side, and much less a germinal membrane occupying, as we read, but a corner in the cavity of the chorion, "*imbedded in a fine gelatinous cellular tissue.*"

I am disposed to place a different construction upon this matter, as circumstance not easily forgotten recurs to my mind, and perhaps will explain it.

In 1845, while at Paris, I was not a little astonished upon examining the uterus of a rabbit, on the twelfth day after gestation, to find in the right cornu, an ovum having all the appearance of being at its blastodermic evolution, while a perfectly villous chorion formed its outer envelop, though no traces of the embryo were present.

Five corpora lutea existed, and the other ova in the uterus, strange to say, were all in the same condition. Professor Coste, in whose laboratory I enjoyed the friendly privilege of conducting my experiments, who also lent me that assistance which his position in science makes me regard as a distinguished honour, observed that he had frequently met with such examples. Struck by disease and arrested in its development, the embryonic amnion, &c., had been absorbed, only leaving a somewhat advanced chorion and the serous layer of the germinal membrane which had not yet adhered to the inner surface of the former. It is not improbable to my mind that such was the nature of the case recorded by Mr. Jones.

In this manner we could account for the apparent inconsistency between its age and its condition. Its size, advanced chorion, resistance to exposure and the variance of opinion concerning its age would then find their proper interpretation.

For a valuable account of another embryo (1837) we are indebted to Professor Coste,* who gives two beautiful drawings representing the most instructive details. This embryo belonged to a late period, comparatively speaking.

A chorion and amnion were formed, the allantois was highly developed slightly adhering to the inner surface of the chorion through means of the *magma réticulé*, or gelatinous substance enveloping the former. Muller, who has re-copied these beautiful figures, computes the age of this ovum as sixteen to twenty days; but as Professor Coste in his work specifies no particular period, I myself consider it younger, regarding Velpeau's case as criterion of development at the thirteenth day.† The authority of Ve

* Embryogénie comparée, vol. i. p. 227, 1837, and Atlas, Pl. III. figs. 4 and 5.

† Elem. of Physiology (Eng. Trans., Baly), vol. ii. p. 1585, 1842.

‡ I am uncertain whether Professor Coste ever expressed his opinion concerning the age of this embryo. He showed me one, which he estimated at twenty-five days; much farther advanced, and was kind enough to allow my having a drawing made of the same.

peau's statements is to be relied on with implicit confidence. In both cases the embryos were enveloped in a perfectly formed amnion; the umbilical aperture in both cases gave passage to the pedicle of the umbilical vesicle; and though Velpeau does not admit an allantois in the human ovum, we know that he described the same while referring to what he terms the "corps réticulé."

At a later date, in 1839, we meet again with the history of three early ova which came under the notice of Dr. Allen Thomson.* Here we should pause before two of these specimens, which at once attract undivided attention, being, as I would say, at the same period of formation. The first belonging to Professor Cumin, of Glasgow, who submitted it to Dr. Thomson, was truly, as he says, "at the very earliest stage of its development, for it lay with its abdominal side nearly flat on the surface of the umbilical vesicle, the abdomen presenting no appearance of intestine as yet, but merely a long and shallow intestinal groove, which formed a common cavity with the interior of the yolk-sac. Around the intestinal groove, the germinal membrane of the fetal parietes was continuous with that on the surface of the yolk-sac." The second was in the possession of Dr. Reid, of Edinburgh. Of this Dr. Thomson says, "we have here the yolk covered by the layers of the germinal membrane forming the yolk-sac or umbilical vesicle; the embryo consisting principally of the rudiments of the cerebro-spinal axis and the intestinal groove, and in which it may be supposed that the heart also had been formed in its first or simplest condition,—a state of parts, which, if such a comparison can be made, approaches to that existing in the incubated egg of the fowl at the thirtieth or thirty-fifth hour."

For some time, I believed I was the first who had the enviable opportunity of witnessing the earliest steps of development in the human species, but the details given above by Dr. Thomson, are signal proofs of a somewhat earlier period than that which I have described. Here, as in my own case, no allantois or intestine had formed; the abdomen of the embryo lay flat, or nearly so, upon the umbilical vesicle, but slightly constricted, and this same filled the cavity of the serous layer of the blastoderma; the chorion, like mine no doubt, was but partly villous; but, unlike what I have described above, the cephalic and caudal extremities were scarcely discernible; the *laminæ dorsalis* were distinct, having not yet united to form an envelop to the rudiments of a cerebro-spinal axis, itself visible; while we are told the outer layer of the blastoderma was continuous with the fetal parietes and yolk-sac.

Though I cannot but yield the precedence to Dr. Thomson in the face of these facts, yet I may question whether the advantage thus obtained diminishes in any respect the value of the case I have recorded. For a long time the mode of formation of the amnios was a problem involving the greatest

* Edinburgh Med. and Surg. Journ., vol. lii., p. 123, &c., Nos. 1 and 2 of Pl. II.

obscurity, and in the human subject until the present moment, I may say, was altogether an analogical speculation. Dr. Thomson, aware of this, merely inferred the process to be the same as in other animals, stating "that no observations had as yet been adduced, in which the *united* state of the cephalic and caudal folds of the amnios had been seen in the human *fœtus*." This, and this principally, is the value of the specimen I examined, in which these very folds were yet separate, and beneath the cephalic one of which I could even introduce a small instrument. I therefore took every care to exclude error. The only source of error might have been the rupture of the adhesion of the amnios, to the serous layer of the blastoderma in the accidental separation of the chorion, but the amniotic opening on the dorsum of the embryo had not a lacerated appearance, but was a veritable fold continuous with the outer layer of the blastoderma—the structure to which it owes its existence. This is what I have endeavoured to represent in the plate as accurately as my limited skill permitted, for it constituted the prominent feature, establishing the method in which the amnion is evolved in the human species, showing it to be identical with what occurs in other classes. I will acknowledge, therefore, that the fortuitous circumstance of meeting this plicated condition of the blastoderma, indemnified me for the disappointment experienced while perusing the memoir of Dr. Thomson. Throughout the paper, I believed that while the embryo was certainly less developed than in my specimen, the membranes were in the same condition in which I had seen them, until I discovered that an amnios had not yet formed, nor was it even commenced.

In the beginning of this paper, it is true, I allude to the ovum as a perfectly normal example, and still opine it is, as far as is compatible with an abortion, when it stands for reason, that an arrest of development occurs not abruptly, but by those slow gradations of decay, which, interrupting the several parts in their successive progress of organization, eventually leave them out of relative unison with each other. Hence, it appears that the embryo was somewhat further advanced than the condition of its amnios would justify; certain it is that no *laminæ dorsales* were visible, though a vertical depression was evident, and yet no intestine or heart was developed, which latter (though I did not examine with reference to it), would have forced itself upon attention had it existed, nor is it probable that such was the case, as there was no evidence of vascularity, no *area vasculosa*.

Bischoff* states that Volkmann (1839) has spoken of an early ovum; but the clavated villousities of a perfect chorion coinciding with a vesicular blastoderma, are sufficient indications to throw great doubt over the matter.

There are yet more cases on record, in which, though suspected, either no ova at all were detected, or when they did exist, offered a comparatively high degree of organization. We meet with interesting communications

* Encyclopédie Anatomique, vol. viii. 1843.

from Burns,* Stanley,† Burdach,‡ Wagner,§ Lee,|| Baer,¶ two other examples by Allen Thomson,** in one of which a *corpus luteum* and decidua membrane were present, but no ovum, though he met in the uterus a vesicle so small and delicate "that it was destroyed as soon as touched;" and more recently in 1843 a doubtful observation by Pauk,†† who, examining the uterus of a young girl at the seventh day after supposed conception, found a Graafian follicle in a turgescient state about eliminating its ovum, and a caduca in an incipient stage; but no spermatozoa were discovered in the vagina, uterus or tubes. In opening the ovarian vesicle the ovum was lost. The woman was perhaps merely at her menstrual period. Again, other and less accurate observations belonging to abnormal conditions of development are recorded by Kieser, Sæmmering, Meckel, Autenrieth, and Hunter,‡‡ but these appertain to periods further advanced.

Such are the remarks which this interesting occurrence suggests, and which it was my intention to have offered much sooner for the press, had it been convenient.

ART. III.—*Isopathia; or, the Parallelism of Diseases.* By JOHN M. B. HARDEN, M. D., of Liberty County, Georgia; Correspondent of the Academy of Natural Sciences, Philadelphia, &c.

Tuberculous or Strumous Types.—Under the head of *Inflammatory Types* we have found that the chief characteristic of the diseases there considered, consisted in the existence in the blood, and subsequent deposition into the tissues of what has been called *plastic lymph*, which resulted either in the *carnification* of an organ or the *formation of false membranes*. To this mode of action Lobstein has well applied the term *EUPLASY*, and such formations may be styled *euplastic*. The diseases which we are now to consider under our present head are all connected by a similar characteristic, with this difference, however, that the products which result from the morbid action are not capable of a perfect organization, but, according to Lobstein, are either *cacoplastic* or *aplastic*, and in this way bear a near resemblance to some of those *purulent diseases* which we have already passed over.

* Edin. Med. and Surg. Journal, vol. ii. p. 1, 1806, and Anat. of the Gravid Uterus, p. 10.

† Med. Trans. of the College of Physicians of London, vol. vi. p. 414, 1820.

‡ De factu humano adnotationes, Leipzig, 1828.

§ Loc. cit., p. 146.

|| Medico-Chirurgical Trans. of London, vol. xvii. p. 474, 1832.

¶ British and Foreign Review, No. 1, Jan., p. 238, 1836.

** Loc. cit., p. 122.

†† Archives Générales de Médecine, vol. iv. (4e Série) p. 60, 1844.

‡‡ Burdach Physiologie, vol. iii., p. 332.